

What is claimed is:

1. A method for determining the offset between at least two origins of a coordinate system used for at least two different defect inspection spaces, the method comprising:

5 collecting multiple sets of data spanning said defect inspection spaces;

filtering said data sets to remove points that introduce noise into correlation calculations ;

determining whether different said data sets show correlation;

10 selecting pairs of said data sets showing correlation greater than or equal to a metric, if different said data sets show correlation; and

calculating coordinate offsets of said origins based on the said selected pairs of said data sets.

2. An apparatus for determining the offset between at least two origins  
15 of a coordinate system used for at least two different defect inspection spaces, comprising:

means for collecting multiple sets of data spanning said defect inspection spaces;

20 means for filtering said data sets to remove points that introduce noise into correlation calculations ;

means for determining whether different said data sets show correlation;

means for selecting pairs of said data sets showing correlation greater than or equal to a metric, if different said data sets show correlation; and means for calculating coordinate offsets of said origins based on the said selected pairs of said data sets.

- 5           3.     A program storage device readable by a machine, tangibly embodying a program of instructions executable by the machine to perform a method of determining the offset between at least two origins of a coordinate system used for at least two different defect inspection spaces, the method comprising:
- 10                     collecting multiple sets of data spanning said defect inspection spaces;
- filtering said data sets to remove points that introduce noise into correlation calculations ;
- determining whether different said data sets show correlation;
- 15                     selecting pairs of said data sets showing correlation greater than or equal to a metric, if different said data sets show correlation; and
- calculating coordinate offsets of said origins based on the said selected pairs of said data sets.

- 20           4.     A method for determining the offset between at least two origins of a coordinate system used for at least two different defect inspections of a wafer at, at least, a first layer and a second layer and with integrated circuits disposed on it, the method comprising:

filtering defect data;

identifying each defect in said second layer lying near each defect in said first layer;

computing coordinate differences between defects in said first layer and said defects in said second layer;

finding dense zones where there are a relatively high density of offsets;

determining whether offsets in said dense zones are distributed randomly;

calculating descriptive statistics, including at least average offsets and confidence limits, for said dense zones if said offsets are not distributed randomly;

10 and

reporting average offset and confidence limits.

5. The method of claim 4, wherein said finding of dense zones comprises:

15 dividing the range of each coordinate offset into a number of equal intervals; and

selecting the interval with the greatest count of offsets as the dense zone.

6. An apparatus for determining the offset between at least two origins of a coordinate system used for at least two different defect inspections of a wafer at, at least, a first layer and a second layer and with integrated circuits disposed on it, comprising:

means for filtering defect data;

means for identifying each defect in said second layer lying near each defect in said first layer;

means for computing coordinate differences between defects in said first layer and said defects in said second layer;

5 means for finding dense zones where there are a relatively high density of offsets;

means for determining whether offsets in said dense zones are distributed randomly;

10 means for calculating descriptive statistics, including at least average offsets and confidence limits, for said dense zones if said offsets are not distributed randomly; and

means for reporting average offset and confidence limits.

7. The apparatus of claim 6, wherein said means for finding of dense zones comprises:

15 means for dividing the range of each coordinate offset into a number of equal intervals; and

means for selecting the interval with the greatest count of offsets as the dense zone.

20 8. A program storage device readable by a machine, tangibly embodying a program of instructions executable by the machine to perform a method for determining the offset between at least two origins of a coordinate system used for at least two different defect inspections of a wafer at, at least, a

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first layer and a second layer and with integrated circuits disposed on it, the method comprising:

filtering defect data;

identifying each defect in said second layer lying near each defect in

5 said first layer;

computing coordinate differences between defects in said first layer and said defects in said second layer;

finding dense zones where there are a relatively high density of offsets;

10 determining whether offsets in said dense zones are distributed randomly;

calculating descriptive statistics, including at least average offsets and confidence limits, for said dense zones if said offsets are not distributed randomly; and

15 reporting average offset and confidence limits.

9. The program storage device of Claim 8, wherein said finding of dense zones further comprises:

dividing the range of each coordinate offset into a number of equal intervals; and

20 selecting the interval with the greatest count of offsets as the dense zone.

10. A method for determining the offset between at least three origins of a coordinate system used for at least three different defect inspections of a wafer with integrated circuits disposed on it, the method comprising:

- 5 finding all possible pairwise links between layers;  
constructing a tree of links;  
identifying from said tree all indirect paths along which layers can  
be linked;  
calculating statistics of offsets between indirectly linked layers;  
10 determining whether any pair of layers are linked by multiple paths;  
listing each pair of layers linked by multiple paths, if there are any  
pair of layers linked by multiple paths;  
selecting a listed pair of layers that have not been previously  
selected;  
15 determining whether offsets associated with said listed pair of layers  
are within confidence limits of each other;  
selecting the best estimate of said offsets;  
determining whether the system has selected all the of the listed  
pairs; and  
20 selecting a listed pair of layers that have not been previously  
selected.

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11 The method of claim 10, wherein selecting said best estimate  
comprises averaging said offsets associated with said listed layer pairs.

12. The method of claim 10, wherein selecting said best estimate  
comprises calculating the median of said offsets associated with said listed layer  
5 pairs.

13. An apparatus for determining the offset between at least three  
origins of a coordinate system used for at least three different defect inspections of  
a wafer with integrated circuits disposed on it, comprising:

means for finding all possible pairwise links between layers;

10 means for constructing a tree of links;

means for identifying from said tree all indirect paths along which  
layers can be linked;

means for calculating statistics of offsets between indirectly linked  
layers;

15 means for determining whether any pair of layers are linked by  
multiple paths;

means for listing each pair of layers linked by multiple paths, if there  
are any pair of layers linked by multiple paths;

20 means for selecting a listed pair of layers that have not been  
previously selected;

means for determining whether offsets associated with said listed  
pair of layers are within confidence limits of each other;

means for selecting the best estimate of said offsets;

means for determining whether the system has selected all the of the

listed pairs; and

means for selecting a listed pair of layers that have not been

5 previously selected.

14. The apparatus claim 13, wherein said means for selecting best estimate further comprises means for averaging said offsets associated with said listed layer pairs.

15. The apparatus of claim 13, wherein said means for selecting said best estimate comprises means for calculating the median of said offsets associated with said listed layer pairs.

16. A program storage device readable by a machine, tangibly embodying a program of instructions executable by the machine to perform a method for determining the offset between at least three origins of a coordinate system used for at least three different defect inspections of a wafer with integrated circuits disposed on it, the method comprising:

finding all possible pairwise links between layers;

constructing a tree of links;

identifying from said tree all indirect paths along which layers can

20 be linked;

calculating statistics of offsets between indirectly linked layers;

determining whether any pair of layers are linked by multiple paths;



listing each pair of layers linked by multiple paths, if there are any pair of layers linked by multiple paths;

selecting a listed pair of layers that have not been previously selected;

5 determining whether offsets associated with said listed pair of layers are within confidence limits of each other;

selecting the best estimate of said offsets;

determining whether the system has selected all the of the listed pairs; and

10 selecting a listed pair of layers that have not been previously selected.

17. The program storage device of claim 16, wherein said selecting the best estimate comprises averaging said offsets associated with said listed layer pairs.

15 18. The program storage device of claim 16, wherein said selecting the best estimate comprises calculating the median of said offsets associated with said listed layer pairs.

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